भारतीय मानक
Indian Standard

IS 5522 : 2014

(Reaffirmed 2019)

बर्तनों के लिए स्टैनलेस इस्पात चद्दरें और पत्तियाँ — विशिष्टि

(तीसरा पुनरीक्षण)

Stainless Steel Sheets and Strips for Utensils — Specification

(Third Revision)

ICS 77.140.20; 77.140.50

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Price Group 3

Alloy Steels and Forgings Sectional Committee, MTD 16

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Alloy Steels and Forgings Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1969 and revised in 1978 and 1992. The following major modifications have been incorporated in this revision.

a) A new grade X07Cr17 is included;
b) For the austenitic grades of X04Cr19Ni9 and X07Cr18Ni9, determination of % nitrogen content is included;
c) Any other established instrumental chemical method is also included alongwith the method specified in IS 228, for the ladle analysis of steel;
d) In case of dispute, the procedure given in IS 228 exists relevant Parts shall be the referee method; and
e) Where method is not given in IS 228 in its relevant Parts, the referee method shall be agreed to between the purchaser and the manufacturer.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STAINLESS STEEL SHEETS AND STRIPS FOR UTENSILS — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirements for stainless steel in the form of sheets and strips for manufacture of utensils.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate and possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
228	Methods for chemical analysis of steels (issued in various parts)
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
1500 (Part 1) : 2013/ISO 6506-1 : 2005	Metallic material — Brinell hardness test: Part 1 Test method (*fourth revision*)
1501(Part 1) : 2013/ ISO 6507-1:2005	Metallic materials — Vickers hardness test: Part 1 Test method (*fourth revision*)
1586(Part 1) : 2012/ ISO 6508-1:2005	Metallic materials — Rockwell hardness test: Part 1 Test method (scales A, B, C, D, E, F, G, H, K, N, T) (*fourth revision*)
1586 : 2000	Method for Rockwell hardness test for metallic material (scales A-B-C-D-E-F-G-H-K)-15N, 30N, 45N, 15T, 30T, 45T) (*third revision*)
1599 : 1985	Method for bend test
1608 : 2005/ISO 6892 : 1996	Mechanical testing of metals — Tensile testing (*third revision*)
1762 (Part 1) : 1974	Code for designation of steels — Part 1 Based on letter symbols (*first revision)*
1956(Part 4) : 1975	Glossary of terms relating to iron and steel: Part 4 Steel sheet and strip
10175 : 1993/ ISO 8490 : 1986	Mechanical testing of metals modified Erichsen cupping test and sheet and strip upto 2.00 mm (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1956 (Part 4) shall apply

4 SUPPLY OF MATERIAL

General requirements relating to the supply of material shall conform to IS 1387.

5 MANUFACTURE

5.1 Unless otherwise agreed to in the order, the processes used in making the steel shall be left to the discretion of the manufacturer.

5.2 Sufficient discard shall be made to ensure freedom from pipe and harmful segregations.

6 FREEDOM FROM DEFECTS

Stainless steel sheets and strips shall be reasonably free from harmful defects, such as scale, rust, blisters, laminations, cracked edges and seams

NOTE — When coil is supplied, the degree or amount of surface defects may be expected to be more than in cut lengths because of the impossibility of rejecting portions of the coils. This should be taken into account by the purchaser in his assessment of coils.

7 CHEMICAL COMPOSITION

7.1 The ladle analysis shall be as given in Table 1. The analysis of steels shall be carried out either by the method specified in IS 228 and its relevant parts or any other established instrumental/chemical method. In case of any dispute the procedure given in IS 228 and its relevant parts shall be referee method. However, where method is not given in IS 228 and its relevant parts, the referee method shall be as agreed to between the purchaser and the manufacturer.

7.2 Check Analysis

In case of check analysis, the permissible variation for the limits specified in Table 1 shall be as given in Table 2.

8 MECHANICAL TEST

8.1 Sample Plan

In case of material annealed in coil form through continuous annealing line, at least one sample shall be

Table 1 Chemical Composition
(*Clauses* 7.1 *and* 7.2)

Grade Designation		Constitutents, Percent							
Letter Symbol [*see* IS 1762 (Part 1)]	Numerical Symbol	C *Max*	Si *Max*	Mn *Max*	Ni	Cr	S *Max*	P *Max*	N *Max*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Austenitic									
X04Cr19Ni9	304	0.07	0.75	2.00	8.0-10.5	17.5 - 19.5	0.030	0.045	0.10
X07Cr18Ni9	302	0.12	0.75	2.00	8.0-10.0	17.0 - 19.0	0.030	0.045	0.10
Ferritic									
X07Cr17	430	0.12	1.00	1.00	0.75, *max*	16.0 - 18.0	0.030	0.040	—

Table 2 Permissible Variation Between Specified Analysis and Check Analysis
(*Clause* 7.2)

Sl No.	Element	Permissible Deviation[1)] Percent
(1)	(2)	(3)
i)	C	± 0.01
ii)	Si	± 0.05
iii)	Mn	± 0.04
iv)	Ni (1%)	± 0.03
v)	Ni (1-10%)	± 0.10
vi)	Cr	± 0.20
vii)	S	± 0.005
viii)	P	± 0.005
ix)	N	± 0.01

[1)] In one cast the deviation may occur over the upper value or under the lower value of the specified range in Table 1.

taken from each coil for carrying out tensile test, hardness test, bend test (if required) and Erichsen cupping test (if required).

In case material annealed in batch process, one tensile test, hardness test, one bend test (if required) and Erichsen cupping test (if required) shall be carried out in each 100 or less number of pieces of the same cut and nominal thickness annealed as a batch.

Test sample shall be cut in such a manner that deformation is avoided as for as possible.

8.2 Tensile Test

When tested in accordance with IS 1608 the tensile strength, proof stress and percentage elongation shall be as given in Table 3

8.3 Hardness Test

The hardness of sheets and strips when determined in accordance with IS 1500 or IS 1501 (Part 1) or IS 1586 shall be as given in Table 3.

8.4 Bend Test

8.4.1 One bend test as given in Table 3, for grade X07Cr17 shall be carried out in accordance with IS 1599.

8.4.2 Bend test piece shall be cut so that the axis of the bend is parallel to the direction of rolling. The test piece shall be bent cold through 180° around a mandrel of diameter equal to the thickness of the sample. The test piece shall be deemed to have passed the test, if it is free from cracks.

Table 3 Mechanical Properties in Annealed/Softened Condition
(*Clauses* 8.2, 8.3 *and* 8.4.1)

Grade Designation		0.2 Percent Proof *Min*	Tensile Strength N/mm²	Percentage Elongation *Min*	Hardness *Max*			Bend Test
Letter symbol [*see* IS 1762 (Part1)]	Numerical Symbol				Brinell HB	Rockwell HRB	Vickers Pyramid	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ISS							
ISSX04Cr19Ni9	304	205	515	40	201	92	197	Not required
X07Cr18Ni9	302	205	515	40	201	92	197	Not required
X07Cr17	430	205	450	20% for <1.27*t* 22% for > 1.27*t*	183	89	184	1*t*[1)]

[1)] *t* — thickness of test piece.

8.5 Erichsen Cupping Test

8.5.1 Subject to agreement between the purchaser and the manufacturer. Cupping test shall be carried out as per sample plan given in **8.1**.

8.5.2 Cupping test shall be applicable only for sheets of drawing, deep drawing and extra deep drawing types having thickness from 0.5 mm to 1.25 mm.

8.5.3 Material when tested as per IS 10175, meet the requirement as given in Table 4.

Table 4 Requirements Modified Erichsen Cupping Test

Thickness mm		Depth of Cup mm, *Min*	
Over and Including	Upto and Including	Austenitic	Ferritic
(1)	(2)	(3)	(4)
—	0.80	10.0	8
0.80	1.25	11	8

9 DIMENSIONS

Dimensions of sheet and strip shall be as follows:

Thickness : 0.20 mm — 4 mm

Length : As per mutual agreement between the purchaser and the manufacturer at the time of enquiry and order

10 DIMENSIONAL TOLERANCES

10.1 Thickness

Permissible variation in thickness shall be as per Table 5.

10.2 Width

10.2.1 *Mill Edge*

Product in mill edge shall have width tolerance as given in Table 6.

Table 6 Permissible Variations in Width for Mill Edge

Width mm	Tolerance on Width mm	
	Plus	Minus
(1)	(2)	(3)
< 1 000	25	0
≥ 1 000	30	0

10.2.2 *Trimmed Edge*

Product in trimmed edge shall have width tolerance as given in Table 7.

10.3 Length

Permissible variation in length shall be as per Table 8.

10.4 Flatness

Permissible variation in flatness for hot rolled and cold rolled sheet shall be as per Table 9.

10.5 Camber

Permissible variation of camber in mill edge as defined in Fig. 1 shall be 5 mm maximum for any 2 000 mm length.

Edge camber is the greatest deviation of a side edge from a straight line. The measurement being taken on the concave side with a straight edge (*see* Fig. 1).

Table 5 Permissible Variations in Thickness
(*Clause* 10.1)

Thickness	Tolerance on Thickness for Width, mm			
mm	<250	250 to <500	500 to <1 000	≥ 1 000
(1)	(2)	(3)	(4)	(5)
From 0.20 to <0.25	± 0.03	± 0.03	± 0.03	± 0.03
From 0.25 to <0.40	± 0.03	± 0.04	± 0.04	± 0.04
From 0.40 to <0.60	± 0.04	± 0.04	± 0.05	± 0.05
From 0.60 to <0.80	± 0.05	± 0.06	± 0.07	± 0.07
From 0.80 to <1.00	± 0.06	± 0.07	± 0.08	± 0.08
From 1.00 to <1.25	± 0.07	± 0.08	± 0.08	± 0.09
From 1.25 to <1.50	± 0.08	± 0.09	± 0.10	± 0.10
From 1.50 to <2.00	± 0.09	± 0.11	± 0.12	± 0.12
From 2.00 to <2.50	± 0.10	± 0.12	± 0.15	± 0.15
From 2.50 to <3.00	± 0.12	± 0.15	± 0.20	± 0.20
From 3.00 to ≤ 4.00	± 0.15	± 0.17	± 0.20	± 0.25

NOTE — Thickness measurements are taken at least 15 mm from the edge of the product in case of trimmed edges at least 25 mm from the edge of the product in case of mill edge

Table 7 Permissible Variations in Width for Trimmed Edge
(*Clause* 10.2.2)

Thickness	**Tolerance on Width,** mm			
mm	<250	250 to <600	600 to <1 000	≥ 1 000
(1)	(2)	(3)	(4)	(5)
< 0.6	± 0.20	± 0.50	± 0.75	± 1.00
From 0.60 to <1.00	± 0.25	± 0.50	± 0.75	± 1.00
From 1.00 to <1.50	± 0.30	± 0.50	± 0.75	± 1.20
From 1.50 to <2.50	± 0.40	± 0.50	± 1.0	± 1.40
From 2.50 to ≤ 4.00	± 0.40	± 0.60	± 1.0	± 1.60

Table 8 Permissible Variations in Length of Hot Rolled or Cold Rolled ≤ 4 000 mm
(*Clause* 10.3)

	Length Tolerance, mm
For all thickness and width	+ 10 - 0

Table 9 Permissible Variations in Flatness Specified Lengths
(*Clause* 10.4)

Width	**Length**	**Normal Flatness**, mm
mm	mm	*Max*
(1)	(2)	(3)
< 1 000	≦ 2 000	15
	> 2 000	20
> 1 000	≦ 2 000	20
	> 2 000	20

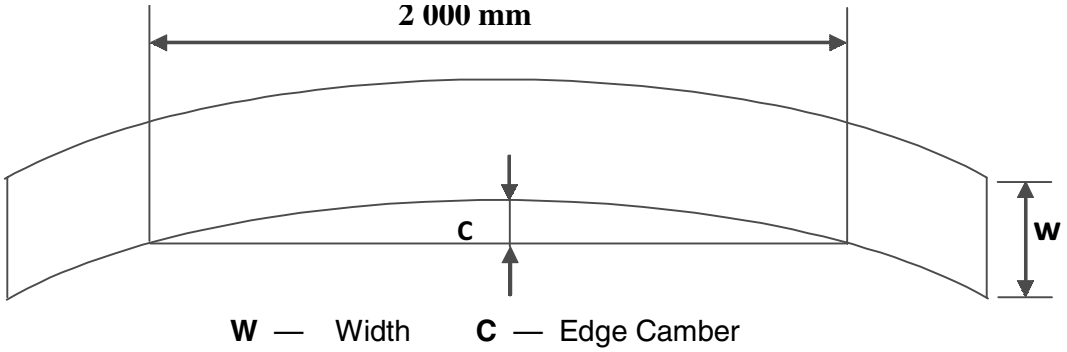

FIG. 1 PLAN VIEW OF SHEET/STRIP SHOWING EDGE CAMBER

11 SURFACE FINISH

The material shall be supplied in one of the standard finishes on both surfaces for mill finishes and one or both surfaces for polished / ground finishes. The different surface finishes are indicated in Table 10. Finish 2D and 2B are classified as mill finishes. Finish No.3 and 4 are produced by mechanical polishing/ grinding and are classified as polished/ground finishes. Some of these standard finishes may not be available on certain rolled products. However, other finishes may be mutually agreed upon between the purchaser and the manufacturer at the time of enquiry and order.

12 PACKING

Material with suitable packing shall be provided to prevent damages and deterioration in quality during storage, handling and transport. The exact method of packing and weight of each packet shall be mutually agreed to between the purchaser and the supplier.

13 MARKING

13.1 Every package of sheets, strips and coils shall be legibly marked with paint showing the name or trademark of the manufacturer, mass, thickness, size, grade and the cast number or identification marks, by which the materials may be traced to the cast or casts from which they are made.

13.2 The material may also be marked with the Standard Mark. Details available with Bureau of Indian Standards.

Table 10 Surface Finish
(*Clause* 11)

Condition (1)	Finish (2)	Description (3)	Remarks (4)
Cold Rolled	2D	Cold Rolled, Annealed and Descaled (Pickled)	A dull, smooth and uniform surface finish most suited for deep drawing applications.
	2B	Cold Rolled, Annealed, Descaled (Pickled) and Skin passed	A smoother and brighter surface finish (as compared to 2D) most suitable for general applications.
	No.3	Coarse grit polished surface finish	A uniform polished surface finish obtained with coarse abrasives of 100-120 grit on one or both surfaces. Suitable for use as a finish polished surface such as for panelling or any other application requiring such surface finish.
	No.4	Standard polished surface finish	A standard uniform polished surface finish produced with abrasives of 120-150 grit size and the finish is finer than No.3 finish. Suitable for general purpose polished finish used for panelling, appliances, equipment and architectural applications.

13.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

14 MATERIAL TEST REPORT AND CERTIFICATION

A report of the results of all the test required by the purchase specification shall be supplied by the manufacturer to the purchaser. The test report shall include manufacturer's certification for conformity to this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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